Partitioning Process

To partition the switch, the team identified the functions of all components in the switch and grouped the functions into major categories. It is important that each functional component of the switch be associated with a cost driver. The cost driver is the network function that triggers the need for additional switching equipment to be placed into operation. Based on experience as switch engineers, team members knew that the primary drivers of switching equipment are call attempts, line port connections, line concentrator usage, network usage, and trunk port connections. Other important switch costs which may not be usage sensitive are maintenance and testing functions. All ancillary mounting equipment, such as frames, is associated with the primary cost drivers and should be partitioned to the appropriate categories.

Based on a thorough evaluation of this particular switch's components, the team developed the following major functional categories:

1) Lines- Line Port Related;
2) MDF and Protector;
3) Lines- Usage Related;
4) Maintenance/ Operations;
5) Network;
6) Processor;
7) Signaling; and,
8) Trunks.

The next step was to assign each individual part of the switch to a functional category or categories. A representative switch was chosen for this

process, and its parts values were assigned based on vendor list prices. Finally, the total dollar amount in each functional category was divided by its capacity in terms of the cost driver that it supports. For example, the investment in trunk port equipment was divided by the number of trunk ports or channels that the equipment could support, producing an investment per trunk port. This investment per port could then be converted to an equivalent investment per minute to be used as a component of local usage investment.

Results of Partitioning Process

The attached Exhibit is an Excel workbook, "Sw_part.xls," that contains a simulated portion of the switch investment model that resulted from the partitioning process. The equipment item descriptions, part numbers, and unit costs in the actual model have been modified with random data to preserve the confidentiality of INDETEC's client and the switch vendor. The switch used in this example was a digital switch with approximately 35,000 working lines and 4500 trunks. Notice that each piece of electronic equipment used in the switch, along with its assignment to a functional category, is clearly identified. The unit equipment quantities are determined by engineering guidelines established by the switch vendor and telephone company engineering experts.

On page 1 of the Exhibit there is a summary of the switch investments by functional category. Note the switch partitioning percentages that result from the process. These could be used directly as input to the BCPM for small switch partitioning.

Application to Cost Proxy Models

We believe that a switch partitioning model such as this can be created for any digital switch. While the switch architectures vary somewhat in detail, all digital switches have the same basic configuration: lines, trunks, speech network, and call processing. The method is equally applicable to host, standalone, and remote switches. The partitioning models can be used to develop inputs for the Benchmark Cost Proxy Model (BCPM), in the absence of SCIS (or SCM) output.

The case study model can clearly be mapped to the set of functional investment categories used in BCPM. This table shows the relationship between the two models:

Case Study Category	BCPM Category	Comments
MDF & Protector	MDF & Protector	
Line Ports	Line Ports	
Line CCS Usage	Line CCS Usage	The switch network equipment (talk paths) is shared between line and trunks.
Network	Trunk CCS Usage	
Trunk CCS Usage		
Processor	Processor Related Investment	The BCPM Processor investment includes maintenance and operations equipment.
Maintenance and Operations		
Signaling	SS7 Investment	

The outputs from this proposed switch model can be used several ways to develop inputs for the BCPM. As mentioned above, the partitioning percentages for individual switch models (5ESS, DMS-100 etc.) can be input directly into the BCPM and used to partition the small switch investments. A second alternative would be to use this model to generate sets of sample offices to be used as input to a linear regression model. The outputs from those regressions could be inputs to the BCPM switch Coefficient Inputs tables. A third alternative would be to perform individual office investment runs with this model and input the total investments, identified by wire center, into the BCPM SCM Inputs table. These options are summarized in the table below:

Summary of Partitioning Model Applications

	Option 1	Option 2	Option 3
Step 1	Run the Partitioning Model for representative host, remote, and standalone switches.	Run the Partitioning Model for a sample of offices.	Run the Partitioning Model for each office in the jurisdiction.
Step 2	Use the partitioning percentages from the	Use inputs and total office investments	Use the total switch investments by

	model as input to the BCPM small switch input table.	from Partitioning Model as input to linear regression.	category as input to the BCPM SCM inputs table.
Step 3		Use the linear regression coefficients as input to the BCPM.	
Note: The BCPM can also accept combinations of the three options.			

Summary

By applying switch-engineering expertise, and obtaining the cooperation of the switch vendor, the team of INDETEC and client subject matter experts was able to create a switch investment model that produces valid TELRIC results for network elements, without needless complexity. The model's inputs, algorithms, and outputs are clearly identified and verifiable. The team proved beyond a doubt that a switch model, which genuinely supports the FCC's TELRIC guidelines, can be constructed at reasonable cost. Similar models could be created to provide input to the switching modules of the BCPM.

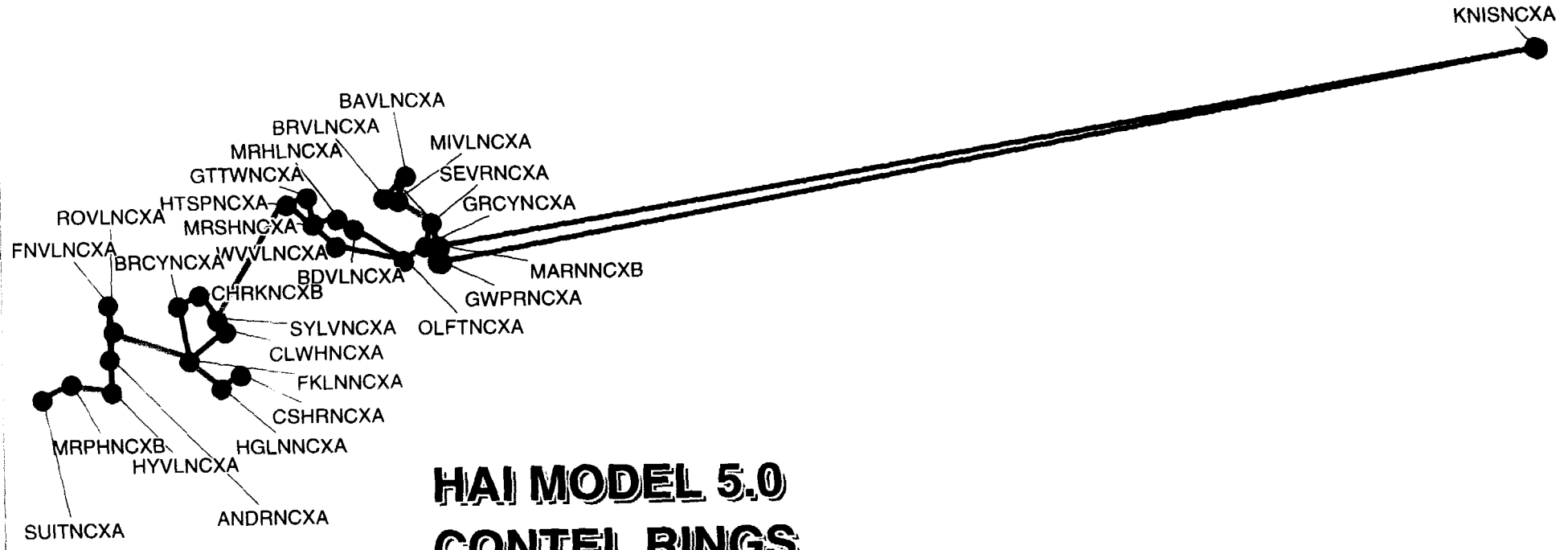
Switch Partitioning **Hypothetical "XL5000" Switch**

Note: Numbers are illustrative and do not represent any specific switch vendor nor all elements of a typical price list.

ITEM	Category	Units	Unit Cost	Total
XL5000 Concentrator	Line CCS Usage	20	$ 45,677.89	$ 913,557.80
XL5000-Subscriber Line Interface Circuit	Line Ports	320	$ 2,986.42	$ 955,655.37
Module(XLDD-0991)	Line Ports	5,120	$ 234.22	$ 1,199,222.01
			$ -	$ -
Trunk mount Unit	Maintenance/Operation	2	$ 866.67	$ 1,733.34
XL5000-Supervisory Test Frame-E(E-STF)	Maintenance/Operation	1	$ 151,729.74	$ 151,729.74
XL5000-Supervisory Equipment	Maintenance/Operation	1	$ 16,905.62	$ 16,905.62
Main Distributing Frame Package	MDF & Protector	1	$ 545,400.00	$ 545,400.00
Mount Frame	Line Ports	360	$ 152.05	$ 54,738.17
Power Module(G5V20A)	Line Ports	360	$ 1,868.81	$ 672,772.79
			$ -	$ -
XL5000-Signaling Equipment Frame	Line CCS Usage	3	$ 12,450.36	$ 37,351.09
Subscriber Line Signaling Equipment	Line CCS Usage	4	$ 12,470.55	$ 49,882.20
PB Receiver Module	Line CCS Usage	12	$ 5,331.20	$ 63,974.41
XL5000-Switch Frame-G	Network	1	$ 45,075.13	$ 45,075.13
XL5000-Time Division NW Equipment(TDNW)	Network	2	$ 121,843.56	$ 243,687.12
HW Switch Module	Network	2	$ 33,780.82	$ 67,561.64
			$ -	$ -
XL5000-Trunk Signaling Equipment	SS7 Investment	7	$ 3,335.15	$ 23,346.06
MF Receiver Module	SS7 Investment	7	$ 1,917.24	$ 13,420.69
End to Center PB Receiver Module	SS7 Investment	7	$ 3,641.52	$ 25,490.62
DP Receiver Module	SS7 Investment	7	$ 5,023.67	$ 35,165.72
Adjunct STP Processor	SS7 Investment	1	$ 189,000.00	$ 189,000.00
Time Division Conector Equipment(TDC)	Trunk CCS Usage	14	$ 14,430.38	$ 202,025.28
Module(XLDD-0045)	Trunk CCS Usage	448	$ 1,256.88	$ 563,082.24
Power Module(G5V20A)	Trunk CCS Usage	64	$ 2,087.52	$ 133,601.05
XL5000entral Processing Equipment Frame	Processor	1	$ 419,132.00	$ 419,132.00
MTM--Processer Equipment	Processor	1	$ 78,046.62	$ 78,046.62
MTM--Memory Module	Processor	2	$ 432.28	$ 864.56
Power Module(G5MTM-400)	Processor	2	$ 862.70	$ 1,725.39
				$ 6,704,146.66

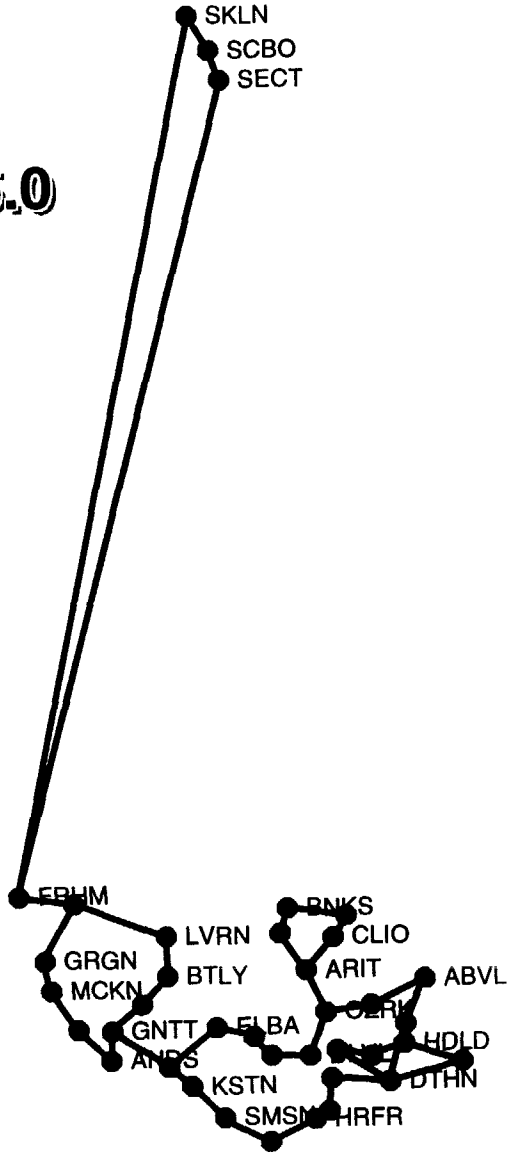
Total Switch Investment by Functional Category

Category	Undiscounted Investment by Partition Category	Percent of Total
Line Ports	$ 2,882,388	42.99%
MDF & Protector	$ 545,400	8.14%
Line CCS Usage	$ 1,064,766	15.88%
Network	$ 356,324	5.31%
Trunk CCS Usage	$ 898,709	13.41%
Processor	$ 499,769	7.45%
Maintenance/Operation	$ 170,369	2.54%
SS7 Investment	$ 286,423	4.27%
Total	$ 6,704,147	100.00%



HAI MODEL 5.0
CONTEL RINGS
NORTH CAROLINA

HAI MODEL 5.0
GTE RINGS
ALABAMA



September 29, 1998

Mr. Peter Sywenki
Director, Federal Regulatory Relations
Sprint
1850 M Street, NW, Suite 1100
Washington, DC 20036

Dear Mr. Sywenki,

This letter is in response to your letter of September 17, 1998. It is our understanding as well that the FCC plans to use our customer location data as an input to HCPM. We do plan to make this data available for review and analysis at our site in Jenkintown but only for the purposes of evaluating the quality or accuracy of our customer locations with the following provisions:

1. All data and software that are to be used during analysis of PNR data must be pre-approved and installed by PNR

2. To protect PNR, their affiliates and other data suppliers, all outputs must be reviewed to assure compliance with the purpose of evaluating the quality and accuracy of customer locations. Outputs that are deemed to go beyond the stated purpose or violate any party's proprietary interests will not be released.

3. There will be a per diem charge of $1000 for each computer that is requested to be set up for analyzing the data.

We also understand the interest in getting outputs from HCPM. As a service we have already begun running HCPM on different versions of input data for some clients and would be happy to do the same for you. For the standard HCPM output we charge from $300 to $1200 per state, depending on number of customers and wire centers. For custom runs, we charge from $1000 to $4000 per state. There is a discount of ten to thirty percent for bulk purchases.

We do have other related data products and services that may be of interest to you. Our National Access Line Model uses a variety of input data as well as PNR models to estimate business and residential lines. This data can be customized to our customer specifications and can also be used for the surrogation process and ultimately for alternative HCPM inputs.

I would be happy to discuss the above or any other way we could be of service to you.

I will give you a call tomorrow or feel free to call me at 215 885-4443.

Sincerely,

Kevin G. Landis
PNR and Associates, Inc.